8806.a.

THE
DESCRIPTION and USE
OF THE
CURRENT LOGG;
OR, AN
INSTRUMENT to try a CURRENT when a Ship is under Sail;

BY WHICH

The true Diſtance may be meaſured, and the Direction and Velocity of the Current at any Time found.

To which is added,

The USE of HADLEY'S QUADRANT.

FOR

Taking of ANGLES and HEIGHTS in ſurveying of Land, Bays, Harbours, &c. or taking the Diſtances of Capes and Headlands when at Sea.

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ERRATA.

Page 7. *Line* 3. *of Notes, for* Yards *read* Miles. *P* 9. *line* 8. *after in, add* C. *p.* 11. *l.* 18. *for* E S E *read* E S C. *p.* 12. *l.* 23. *for* C *r.* 6. *p.* 15. *l.* 19. *for* o *read* ſo. *p.* 17. *l.* 6. *for* as as *r.* as a.

TO THE

READER.

THE following Method of trying a Current when a Ship is under ſail, will prove very uſeful to Mariners on long Voyages, or in going from one Iſland to another, where (for the moſt Part) if they be not far diſtant, the Current runs pretty ſtrong, and is ſometimes imagined to do ſo, when in reality it does not.

I have known a Commander of one of his Majeſty's Ships, in going from *Antigua* to *Barbadoes*, when about ten Leagues to leeward of the latter, imagine himſelf to windward of it, and ſo bear away before the Wind, without diſcovering his Miſtake, till he ſaw; and came within five Leagues of *St. Vincent*'s, which is about 30 Leagues to leeward of *Barbadoes*, and in the ſame Parallel; but had he been acquainted with, and tried this Method, he might have been ſenſible of the Miſtake, and known the Bearing and Diſtance of *Barbadoes*.

I would adviſe all Commanders of Ships and Veſſels to get ſuch an Inſtrument as the one hereafter deſcribed, and to make themſelves Maſters of the Uſe thereof, by the few following eaſy Problems, which, if they do, they will ſeldom miſs their Port, but in general find their Reckonings prove true.

I have ſhewn by a Note in the 6th Page, that the Length of a Knot with a Glaſs of 30 Seconds ought to be 50 Feet $11\frac{3}{5}$ Inches; and with a Glaſs of 28 Seconds it ought to be 47 Feet 6.82,6 Inches; but as it is better that the reckoning ſhould be a-head of the Ship, than that the Ship ſhould be a-head of the Reckonings, I would adviſe the Mariner to ſhorten the Knots about 16 or 18 Inches each, on both Loggs.

I ſhall only add as a Recommendation to this Current Logg, that if it does not prove uſeful to many, it can prove hurtful to none, for Mariners muſt ſtill uſe the Common Logg, and keep their Journals as uſual, but by uſing this Current Logg at the ſame Time, they will, I hope, have an Opportunity of proving its Utility.

DIRECTIONS

FOR MAKING

An INSTRUMENT to try a CURRENT, when a Ship is under Sail.

FIGURE I.

LET there be a Piece of Board about three Inches thick, as a A B D C, of an Iſoſcles Form, from B to C 12, conſequently from A to B or C will be 21. 86 Inches.* Let the Board be conſiderably narrower (in the Surface) below than above, by plaining down or championing the Edges from A to B and C.— Let A be a little bent or turn'd up from R and H, that ſo the Point may be conſpicuous above the Water, but not ſo high as to interrupt the Motion of the Line N. 1. hereafter deſcribed, then will A always Point right againſt the Current. —Let there be a Weight ſuſpended from the Center under the Board as M O, with a Line of 10, 15, 20, 30, or 40 Fathoms *, long enough to go under the Current, and the Weight heavy enough to ſteady the Board, ſo as to keep it immoveable, but not to ſink it under the Surface †.— Let there be a round Pin, about an Inch and a half high erected on the Center of the Board, of Wood, Iron or Braſs as M L ‡; let it be ſmalleſt in the Middle as at 1, to which let there be a ſtrong Braſs Wire, or Chain faſten'd § to move freely round it.——On L the Top of the Pin, let the Croſs Diameters of Wood, Iron, or Braſs, (about ſix Inches long each) T K and S I be placed, at the Extremeties of which, let the Circle S T I K be conſtructed, which Circle will be ſup-

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* Any Board proportioned as above, whether of a ſmaller or larger Size, will anſwer the Purpoſe.

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* You muſt have different Lengths of Line to ſhip and unſhip.

† The Weights may be of Lead or Iron of various Sizes, and they may be hollow'd in the form of a Pott, ſuſpended by a ſhort Rope, and are to be bent to the Line, in the ſame Manner that the Lead is to the deep Sea Line. You may ſee before it goes from the Stern of the Ship, whether the Weight ſinks the Board, if ſo, then take it in and bend a ſmaller Weight to it.

‡ When I mentioned M O, I ſuppos'd M to be under the Board right in its Center, and here again I uſe M, as on the Center of the upper Surface of the Board.

§ The Wire or Chain is to be faſten'd to a Ring of Braſs, which muſt ſurround the Perpendicular at 1, and move freely around it. The Wire may likewiſe move on this Ring.

ported by theſe Diameters.——Let the Wire extend about an Inch or two beyond the Circle S T I K, and that Part of it which comes under the Circle, may be covered with a Plate of Braſs (as at b) which ſhall roll with as little Friction as poſſible under the Circle, which muſt be ſmooth below for that Purpoſe, that ſo the Point of the Board at A may retain its proper Direction againſt the Current *.

If A be not rais'd enough ſo as viſibly to ſet the Direction of the Current, then may you erect two round Sticks painted white, or ſuch Things as you can moſt eaſily diſtinguiſh, at the Periphery of the Circle, one on T, and the other on K, in a Line with the Point of Direction A, and you may ſet their Direction by the Compaſs with more Eaſe than you could that of the Point A.

At

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[*] From M on the upper Surface of the Board, or between M and 1, there may be three or four Radii erected in a ſlanting Manner, on which may be conſtructed a Circle, about half an Inch under the Circle S T I K, and the ſame (or a very little more) in Circumference as it; the Radii may be a little bent in the inner Side, and the Circumference of the Circle ſmooth, that ſo they may not interrupt the Motion of the Wire. This Circle will ſerve to ſupport the Wire, or Chain, and keep it from lying on the Board to interrupt the Motion of the Point A. Or this Circle may be made of ſolid

At the End of the Braſs Wire, or Chain, let there be a Ring of Iron or Braſs, as at P, to which let there be a deep Sea Line bent as P N, (or any Line ſtrong enough to draw home the Board) divided into Knots in the ſame Manner as the Logg Line. This Board is to be thrown over at the ſame Time with the Common Logg, or rather at a Time when you judge that the Ship goes with the ſame Velocity as when the Common Logg was hove, which would be better; for ſhould they be both hove at the ſame Time, the Lines on Account of the Current might get foul of each other. But if you heave them at the ſame Time, take care that the Mark (for ordering the Glaſs to be turned) on both Loggs, go over the Stern at once (for the Current Logg muſt have Stray Line the ſame as the Common Logg) then will the Knots run out by the Current Logg be the true Diſtance ſailed, and the Difference between this and the Common Logg, will be what the Ship is retarded, or forwarded by the Current's Motion.

Though what I have already ſaid concerning the Common Logg, be neceſſary in order to find the Current's Direction, yet as you cannot ſet a Curent by this

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ſolid Wood, in the form of a Diſh, or Bowl, to ſurround the lower Part of the Perpendicular.

Inſtrument in the Night, you may find the true Diſtance, by uſing a Board of any Form, which muſt have a Weight ſuſpended to the Middle of it below, (faſten'd to a Cleet) and a Line fixt to the Center of it above (either by a Cleet, or a Pin erected) and if this Board be of an Iſoſcles form, the Direction of the Current may be pretty nearly ſet by Day.

This Method of trying a Current muſt undoubtedly be as juſt, as that of getting out a Boat, for it is founded on the ſame Principles, and no one can deny but it is far eaſier. By a Boat you are hindered for a conſiderable Time, and in Voyages, it is not to be ſuppoſed, that Mariners can take the Trouble of getting out the Boat ſo often as once a Day, whereas they may with Eaſe try this every Watch, and eſpecially in the Evening and Morning, that ſo they may the better judge how the Current ſets during the Night.

CASE I.

If your Ship is becalmed, and you would find the Courſe and Velocity of the Current, throw this Logg over the Side or Bow from which you judge the Ship falls off, then after ſhe has drove the Length of the Stray-line, turn the Glaſs, and what Part of the Logg ſhe runs out, in the Time the Glaſs is in running, will be the Velocity of the Current, and the Direction of the Point of the Board A, will be the Point of the Compaſs from which the Current ſets.

CASE II.

When a Ship is under Sail, and (the Current Logg being hove) the Point A is directed right towards the Stern of the Ship, then the Current ſets right againſt the Courſe.

EXAMPLE.

Suppoſe a Ship ſails N N E, at the Rate of four Miles by the Common Logg, but by the Current Logg only 2 Knots 5 Fathoms, then the Current ſets S S W at the Rate of 1 Knot 2 Fathoms, or 1 2/7 Mile an Hour *.

CASE

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* Here I have ſuppoſed that a Knot contains only 7 Fathoms, but as one Degree of Latitude has been found to contain 69 ½ Engliſh Statute Miles, therefore 60 Nautical, or Sea Miles, are equal to 69 ½ Engliſh Miles, conſequently the Length of a Knot, if you uſe a half Minute Glaſs, ought to be 50 Feet 11 ⅔ Inches; and if you uſe a Glaſs of 28 Second (which is moſt commonly done) it ought to be 47 Feet 6.826 Inches, as will appear by the following Operations.

Ex. If in 60 Hours I go 69 ½ Engliſh Miles; (which is going at the Rate of 1 Nautical Mile per Hour) how much do I go in one Hour? i. e. What is the Length of one Nautical Mile? *Anſ.* 2038 Yards 2 Feet.

Operation

CASE III.

When a Ship is under Sail, and (the Current Logg being hove) the Point A is directed

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Operation
1760 the Yards in a Statute Mile.
$69\frac{1}{2}$ the Yards in one Degree of Latitude.
15840
10560
880
122320 Yards in a Degree of Latitude.

Miles. Yards Mile.
If 60 : 122320 : : 1
60 | 122320
2038 Yards 2 Feet

Now for the Length of a Knot with a Glaſs 30 Seconds.

If one Hour gives 2038 Yards 2 Feet, (the Length of a Nautical, or Sea Mile) what will 30 Seconds give? Anſwer 50 Feet, 11 $\frac{3}{5}$ Inch.

60 2038.2
60 Sec. 3 Feet in a Yard
3600 : 6116 : : 30
120 : 6116 : : 1
120) 6116 (50 Feet 11 $\frac{3}{5}$ Inches.
116
12
1392 (11
192
72 | 6 | 3
120 | 10 | 5

Again

ted quite contrary to the Courſe, then the Current ſets right after the Ship.

EXAMPLE.

Suppoſe a Ship ſails S W by the Logg at the Rate of 4 Miles an Hour, but by the Current Logg at the Rate of 7 Miles an Hour, and the Point A is directed as in the Caſe. Here the Current ſets right after the Ship, *viz.* S W, at the Rate of 3 Miles an Hour.

The following Problems will be ſufficient to ſhew the Uſe of the Current Logg.

PROBLEM I.

Suppoſe a Ship ſails by the Logg S E by S, at the Rate of 3 Miles an Hour, but by this Inſtrument I find that ſhe ſails at the Rate of 4 Miles, and that A is directed due North; required the Ship's true Courſe and the Velocity of the Current?

Again for the Length of a Knot, with a Glaſs of 28 Seconds.

	Seconds	Feet		Seconds
If	3600	6116	:	28
	900	7		7
		428,12		
		47,512		
		12		
		61.44		
		6.826		

CONSTRUCTION.

Fig. 2. Let S repreſent the Place of the Ship at heaving the Logg, draw the Meridian S M, and lay off the S E by S Line S E=3; and becauſe A was directed North, from E draw a Line parallel to the Meridian, as E C, take 4 in your Compaſſes, and ſet one Foot in S, then with the other cut E C in , draw S C, then is C the Ship's true Place, the Angle C S M her true Courſe, and E C the Velocity of the Current; to find which, in the Triangle E S C, are given the Sides S E=3, S C=4, and the Angle at E=146° 15' the Difference between the North and S E by S Lines, then for the Angle at C it will be

As the Side S C=4 ——	0.60206
Is to the Sine of S C E=146° 15'	9.74474
So is the Side S E=3 ——	0.47712
To the Sine of S C E=24° 37' —	9.61980

The Angle S E C=	146° 15'
The Angle S C E=	24° 37'
Their Sum is	170° 52'
	180°
The Remainder is	9° 08'

which is the Angle E S C, by which the Courſe is leſſened, or brought ſo much nearer the Meridian. The Courſe by the Compaſs is 34° 45', from which taking 9° 8', there remains 24° 37', the Ship's true Courſe from South towards the Eaſt.

Now to find the Velocity of the Current it will be

As the Sine of the Angle S E C=
146° 15′ - - 9.74474
Is to the Side S C=4 - 0.60206
So is the Sine of the Angle E S C=
9° 8′ - - 9.20067
To the Side E C=1.143 - .05799

Anſwer. The Ship ſailed S 24° 37′ E at the Rate of 4 Miles an Hour, and the Current ſet South at the Rate of 1.143 Mile an Hour.

PROBLEM II.

Suppoſe a Ship ſails N N W by the Logg, at the Rate of 4 Miles an Hour, but by the Current Logg only 3 Miles an Hour, and I obſerve that A is directed W N W, I demand the Ship's true Courſe and the Velocity of the Current?

CONSTRUCTION.

Fig. 3. Let S repreſent the Ship's Place at the Time of heaving the Logg, draw the Meridian S M, and the N N W Line S E=4, draw S I the E S E and W N W Line, the Direction of the Current, then draw E C parallel to the E S E Line; take 3 in your Compaſſes, and ſetting one Foot in S, with the other cut E C in C, then will C be the Ship's true Place, and E C the Drift or Velocity of the Current, to find which in the

Triangle E S C are given the Sides S E=4, S C=3, and the Angle at E=45°, the Difference between the E S E and S S E Lines, then to find the Angle at C, it will be

As the ſide S C=3 - 0.47712
Is to the Sine of the Angle S E C=
45° 00′ - - 9.84948
So is the Side S E=4 - 0.60206
To the Sine of the Angle S C E=
70° 32′ - - 9.97442

The Angle S E C=45° —
The Angle S C E=70° 32′
Their Sum is 115° 32′
180° —
The Angle E S C is 64° 28′
to the Eaſtward from the N N W Line.

From the Angle E S E - 64° 28′
Subſtract the N N W - 22° 30′
The Remainder is the Ship's
Courſe - N 41° 58′ E

Then for the Velocity of the Current it will be

As the Sine of the Angle S C E=
70° 30′ - - 9.97444
Is to the Side S E=4 - 0.60206
So is the Sine of the Angle E S C=
64° 28′ - - 9.95537
To the Velocity of the Current,
E C=3. 83 - 0.58299

Here the Ship's true Courſe is N 41° 58′ E, and the Velocity of the Current 3.83 Miles an Hour, which is pretty near the Diſtance given by the Logg.

By this Example you ſee, that the Courſe ſteered by the Compaſs may differ greatly from the true Courſe; hence it can be no Matter of Surpriſe that Mariners frequently in long Voyages may be very far out of their Reckonings, which often proves fatal to many brave Men.

PROBLEM III.

Suppoſe a Ship ſails by the Logg S W 4 Miles an Hour, in a Current which I obſerve by the Direction of A to ſet W, but by the Current Logg ſhe runs at the Rate of 6 Miles an Hour, I demand her true Courſe and the Velocity of the Current?

CONSTRUCTION.

Fig. 4. Let S repreſent the Ship's Place at heaving the Logg. Draw S I W the Weſt Line at Pleaſure, and S E the S W Line=4, from E draw E C parallel to the Weſt Line, then taking C in your Compaſſes, ſet one Foot in S, and with the other cut E C in C, then will C be the Ship's true Place. Draw the Meridian S M, and the Angle C S M will be the Ship's true Courſe, and the Side E C the Velocity of the Current. To find which, in the Triangle E S C are given the Sides S C=6,

S E=4, and the Angle S E C=135° 00′, the Difference between the W and N E Lines, then for the Angle S C E it will be

As the Side S C=6 -	0.77815
Is to the Sine of the Angle S E C= 135° 0′ - -	9.84949
So is the Side S E=4 - -	0.60206
To the Sine of the Angle S C E= 28° 7′ - -	9.67340

The Anglo S E C=	135° 0′
The Angle S C E=	28° 7′
Their Sum is -	163° 7′
	180° 0′
The Angle C S E is	16° 53′

then the Courſe is 16° 53′ to the weſtward of the S W Point.

Now for the Velocity of the Current, it will be

As the Sine of the Angle S C E= 28° 7′ - -	9.67340
Is to the Side S E=4 -	0.60206
So is the Sine of the Angle C S E= 16° 53′ - -	9.46303
To the Velocity of the Current C E 2.46 - -	0.39169

Anſwer. The Ship ſailed S 61° 53′ W, at the Rate of 6 Miles an Hour, in a Current ſetting Weſt at the Rate of 2.46 Miles an Hour.

PROBLEM IV.

Suppoſe a Ship ſails between N and W for the Space of 24 Hours, and on reducing the Courſes into one, I find ſhe has ſailed by the Common Logg 40 Leagues, but by the Current Logg 51 Leagues, and in that Time, ſhe has altered her Latitude 1° 46′ by Account, but by an Obſervation taken either at Noon, or (by two Altitudes) in the Forenoon or Afternoon, I find that ſhe has got 2° 4′ to the northward, and I obſerved that A was generally directed between the S and E. Required the Ship's true Courſe; likewiſe the Courſe and Velocity of the Current?

CONSTRUCTION.

Fig. 5. Let S repreſent the Place of the Ship at ſetting out. Draw the Meridian S M=124 (the Difference of Latitude by Obſervation) raiſe a Perpendicular at M, and draw M C at Pleaſure. From S lay off S I=106, (the Difference of Latitude by Account) upon S M to I. At I raiſe a Perpendicular I E, and taking 120 in your Compaſſes, ſet one Foot in S, and with the other cut the Perpendicular I E in E; then taking 153 (the Diſtance by the Current Logg) in your Compaſſes; ſet one Foot in S, and with the other cut M C in C. Join S E, S C and E C, then will C be the

Ship's true Place, E the Ship's Place by Account, the Angle C S M the Ship's true Courſe, and E C the Courſe and Velocity of the Current. To find which, in the Triangle I S E are given the Sides S I=106, S E=120, and the Right Angle at I=90°, then to find the Angle I S E it will be

As the Side E S=120	-	2.07918
Is to the Radius S 90°	-	10.00000
So is the Side S I=106	-	2.02531
To the Co-ſine of E S I=27° 57′		9.94613

then the Ship's Courſe by Account is N 27° 57′ W. Again, in the Triangle C S M, are given the Sides C S=153, S M=124, and the Angle at M=90°, whence to find the Angle C S M it will be

As the Side S C=153	-	2.18469
Is to the Radius S 90°	-	10.00000
o is the Side S M=124	-	2.09342
To the Co-ſine of S C M=35° 52′		9.90873

The Angle C S M 35° 52′
The Angle E S I 27° 57′
Their Difference is 7° 55′, the Angle C S E.

Now in the Triangle C S E are given the Sides S E=120, S C=153, and the included Angle at S=7° 55′, then to find the other Angles it will be

As the Sum of the Sides S E and S C 273 - - 2.43616
Is to their Difference 33 - 1.51851
So is the Tangent of Half the Sum of the unknown Angles S E C and S C E 86° 2½′ - 11.15992
To the Tangent of Half of their Difference 60° 12′ - 10.24227

Half the Sum of the Angles S E C and S C E is - - 86° 02½′
Half their Difference is - 60° 12′
Their Sum is the Angle S E C - 146° 14½′
Their Difference is the Angle S C E 25° 50½′

Then for the Velocity of the Current E C, it will be

As the Sine of the Angle S C E 25° 50′ - 9.63940
Is to the Side S E 120 - 2.07918
So is the Sine of the Angle C S E 7° 55′ - - 9.13904
To the Current's Velocity E C 37 Miles 1.56882

Now to find the Direction of the Current, draw E D parallel to S M, then will E D be = 18 the Difference between 106 and 124, and in the Triangle E C D are given the Sides E C = 37, E D = 18, and the Right Angle at D, to find the Angle D E C, hence it will be

As the Side C E = 37 - 1.56882
Is to the Radius S 90° - 10.00000
So is the Side D E = 18 - 1.25527
To the Co-sine of C E D 60° 56′ 9.68645

Anſwer. The Ship's true Courſe has been N 35° 52′ W, Diſtance 153 Miles; and the Current has ſet N 60° 56′ W, at the Rate of 37 Miles in 24 Hours.

As the before deſcrib'd Logg muſt be alike uſeful in Calms, as as Boat, for trying of Currents, and much more practicable, I am hopeful that in a ſhort Time I may ſee publiſh'd, an Account of the Setting of Currents in various Seas, and at various Seaſons; and that the Practice and Experiments of learned and curious Mariners, will in a ſhort Time improve this Logg, ſo that it may Anſwer all the propoſed and intended Purpoſes; by which means Navigation will become much more certain, and long Voyages will be performed in a ſhorter Time than they generally are, for the Mariner will be careful to avoid contrary Currents, and will not bring his Ship too at Night, till he be ſure that he is near Land.

If a Ship ſails at the Rate of 6, 8, 10, or 12 Knots an Hour, then may you ſhorten Sail in order to try the Current, for you cannot ſo accurately Meaſure the Difference between the Diſtances given by the Common and Current Loggs, nor ſo eaſily ſet the Direction of the Point A, when the Ship goes with ſuch Velocity, as you could, were ſhe going only at the Rate of 2, 3, or 4 Knots an Hour. This can be no great Hindrance to you, as in general you may not have Occaſion to heave the Current Logg above three or four Times in twenty four Hours, and in that Time you may for other Reaſons be obliged to ſhorten Sail.

THE
USE
OF
HADLEY's QUADRANT,
FOR
Taking of ANGLES and HEIGHTS in ſurveying of Land, Bays, Harbours, &c.

AND

Taking the DISTANCES of Capes and Headland when at Sea.

THE
USE
OF
HADLEY's QUADRANT,

AS I do not propoſe here to give Directions for Surveying of Land, Bays, Harbours, &c. nor to treat of all the Uſes of HADLEY's Quadrant, theſe Subjects having been already treated of (by many learned Authors) but to ſhew the Uſe of this excellent Inſtrument as before-mentioned, I ſhall therefore only give the Reader the few following Directions and Examples.

DIRECTION I.

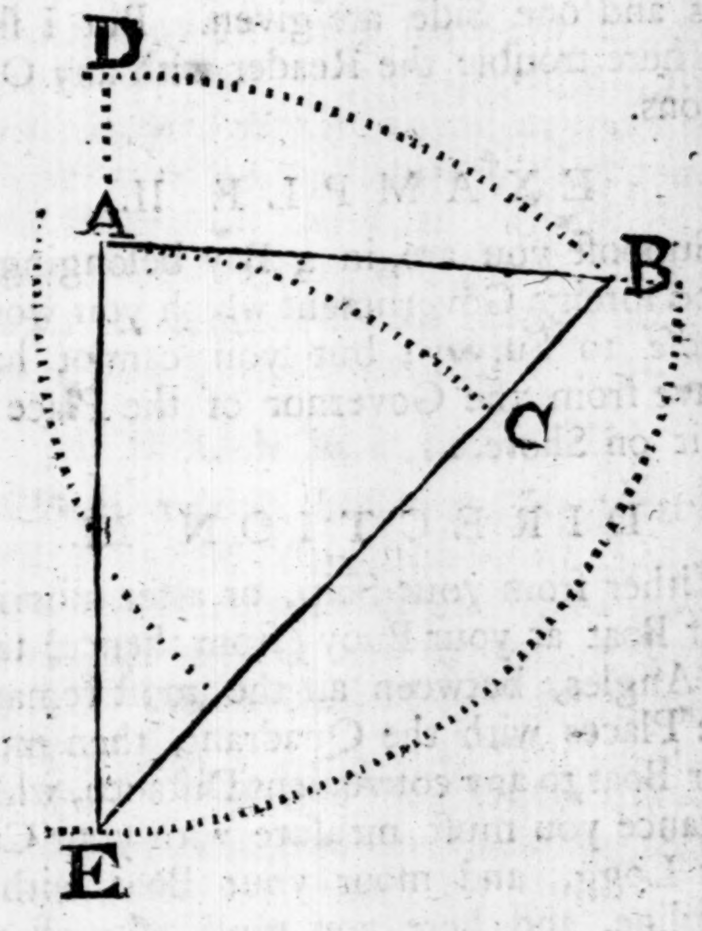
Let the Quadrant be adjuſted as uſual for the taking an Obſervation, put back, or rather take off the dark Glaſſes, place O on the Index to O on the Circular Part, i. e. to the ſame Place as when you adjuſt the Quadrant; place the Sides and Circular Part in a Horizontal Poſition; look through the Hole in the Braſs (which you uſe when obſerving) to any Object, and and let your Attention be fixt on ſome other Object on your left Hand, (if the Speculum of the Index be uppermoſt) and move the Index gently along, ſo as to keep the Reflection of the Object you look at, till you bring it in a Line with the Object on your Left, on which your Attention was fixt, then will the Degrees and Minutes cut down by the Index, be equal to the Angle form'd by theſe two Objects with your Eye.

EXAMPLE I.

Suppoſe two Hills A and B which are known to be 9 Miles Diſtant, and to bear Eaſt and Weſt from each other, and the Hill B bears N E ½ N from me, I demand my Diſtance from each Hill?

DIRECTION II.

Place the Quadrant as before directed, and move the Index (with the Speculum turned either upwards or downwards as may beſt ſuit) till you bring the Hill A in a Line with Hill B, as the Arch A C, or the Hill B in a Line with the Hill A, as the Arch B D, and then ſee how many Degrees and Minutes are cut down by the Index, ſuppoſe 41° 30′ which will be the Angle form'd by theſe Hills and the Eye.



CONSTRUCTION.

FIG. I. Draw the E and W Line A B = 9, the Diſtance between the Hills, from B draw the S W $\frac{1}{2}$ S Line B C at Pleaſure. At A make an Angle = $87^\circ\ 52'\frac{1}{2}$ the Supplement of the Angles B and E and and its done. Then may the Diſtance of the Hills E A and E B be meaſured on the ſame Scale from which 9 (the Diſtance between the Hills) was taken. Or it may be found Trigonometrically as all the Angles and one Side are given. But I ſhall not here trouble the Reader with any Operations.

EXAMPLE II.

Suppoſe you are in a Bay belonging to ſome foreign Government which you would chooſe to Survey; but you cannot have Leave from the Governor of the Place to do it on Shore.

DIRECTION III.

Either from your Ship, or after mooring your Boat at your Buoy (from thence) take the Angles, between all the moſt remarkable Places with the Quadrant, then move your Boat to any convenient Diſtance, which Diſtance you muſt meaſure with your Current Logg, and moor your Boat with a Grapline, and here you muſt take all the Angles you took at your firſt Station; but ſee that your Ship (in the Time you are taking the Angles) does not ſwing or alter her Poſition. You muſt take the Bearings of your two Stations by the Compaſs, and of any one of the Objects in the Bay. By this Method you may be able to lay down the Plan of the Bay with as much Accuracy as if you had been on Shore.

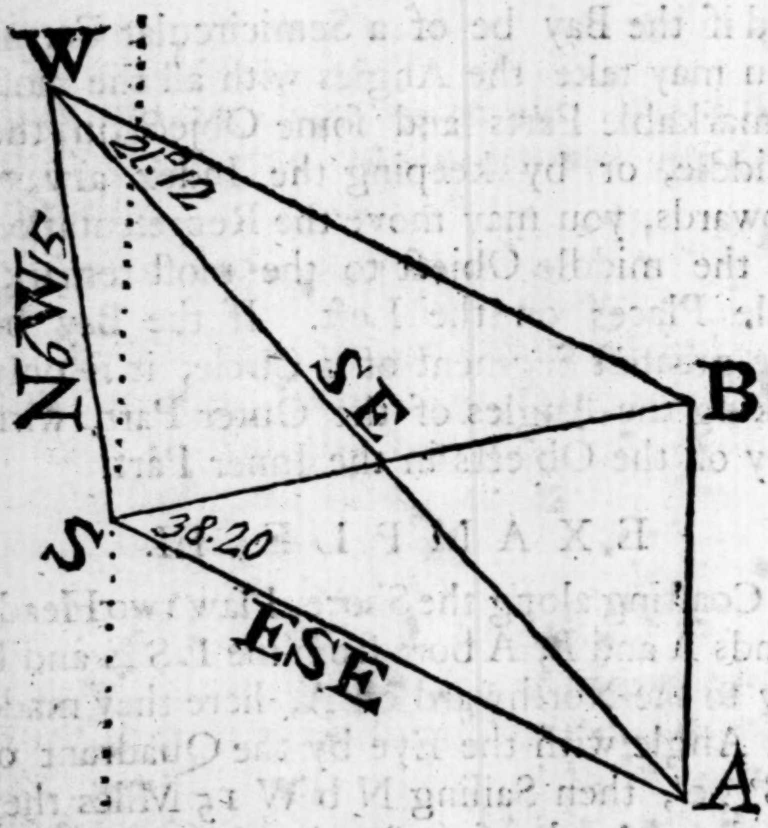
When Surveying in this Manner (as the Quadrant only contains 90°) you may turn the Index downwards as well as upwards, and if the Bay be of a Semicircular Form, you may take the Angles with all the moſt remarkable Parts and ſome Object in the Middle, or by keeping the Index always upwards, you may move the Repreſentation of the middle Object to the moſt remarkable Places on the Left. If the Bay be the greateſt Segment of a Circle, it is only taking the Angles of the Outer Part, with any of the Objects in the Inner Part.

EXAMPLE III.

Coaſting along the Shore, I ſaw two Headlands A and B, A bore from me E S E and B lay to the Northward of A, here they made an Angle with the Eye by the Quadrant of 38° 20′, then Sailing N b W 15 Miles they made an Angle of 21° 12′ and A bore from me S E. I demand their Diſtance from me at each Station, and their Bearing and Diſtance from each other?

CONSTRUCTION.

FIG. II, Draw the E S E Line S A, with it make an Angle =38° 20′ towards B, from S draw the W b N Line S W=15 miles. From W draw the S E Line W A to cut S A in A, and with W A make the Angle A W B 21° 12′. Join A and B and it's done.



The Diſtance at each Station may be meaſured (as before) or it may be found Trigonometrically, for in the Triangle W S A are given the Angle S W A the Difference between the S E and S b E Lines = 33° 45′, and the Angle W S A the Difference between the N b W and E S E Lines = 123° 45′ conſequently the Angle W A S = 22° 30′, and the Side S W = 15 Miles, by which S A and W A may be eaſily found. Again in the Triangle W S B are given the Angles W S B, S W B conſequently the Angle W B S, and the Side S W = 15 Miles, then W B may be eaſily found. Now having W B, W A and the Angle A W B the Side A B may be found, which is the Diſtance of the two Headlands from each other, and likewiſe the Angles at A and B which will give their Bearings, but this I ſhall leave to the Reader.

By the foregoing Examples you may ſee how eaſy it is to take Angles in Surveying of Land, &c. by this Inſtrument, the only difficulty being to find the Bearings of the Fields, &c. ſurvey'd, but you may find the Meridian at Noon by the Quadrant, and there being various other Methods to draw a North and South Line, this Difficulty vaniſheth, for having the Meridian any other of the Points may be eaſily laid down.

Now to take the Heighth of any Object, this is done in the ſame Manner you take the Sun's Altitude, by bringing the Top of the Object to the Horizon, or on a level with any other Object, above which you may deſire to take it's Heighth. In like Manner, if in Chaſe of a Ship at Sea, you take her Heighth above the Water, by trying this again at a little Interval of Time (and ſeeing whether you raiſe or depreſs her) you may know whether you come up with her, or ſhe goes from you.

FINIS.

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Directions to Sailors, Travellers, or Collectors of Rarities at home or abroad.

ALL Animals, Fiſhes, Serpents, Lizards, and other fleſhy bodies, capable of corruption, are eaſily preſerved in Arrack, Rum, Brandy, or any Spirits, or in a ſtrong Pickle, or Brine of Sea-Water; to every gallon of which put three or four handfuls of common or bay Salt, with a ſpoonful or two of Allum powdered, in a pot, bottle, jar, or caſk well ſtopt, &c.

In the ſame manner may be ſent all pulpy moiſt Fruit, either large or ſmall, that are apt to decay or rot, as Apples, Cherries, Cucumbers, Oranges, &c. To all Fruits tie a ſprig of its leaves.

As to Fowls, thoſe that are large, if we cannot have their Caſes whole, their Head, Legs and Wings will be acceptable; but ſmaller Birds are eaſily preſerved intire, by opening their Bodies, by cutting them under the Wing, and taking out their Entrails: Then ſtuff them with Ockam or Tow, mix'd with Pitch or Tar, and being throughly dried in the Sun, wrap them up cloſe, and keep them from Moiſture.

In collecting of Plants, get that part of either Tree or Herb that hath its Flower, Seed, or Fruit on it; but if none, then gather it as it is: and if the Leaves, which grow near the Root of any Herb, differ from thoſe above, get both to compleat the Specimen, theſe muſt be put into a Book, or a Quire of brown-Paper (which you muſt take with you as ſoon as gathered) and once a Week ſhift them to a freſh place, to prevent rotting them, or the Paper.

All ſmall Seed, and dry Fruit, as Nuts, Pods, Heads, Huſks, &c. need no other care, but to be leiſurely dried and wrap'd in Paper, to each of theſe if you add a Leaf or two and a Flower it will be the more inſtructive, and alſo a piece of the Wood, Bark, Root, Gum or Roſin, of any Tree or Herb, that is remarkable for its Beauty, Smell, Uſe or Virtue.

In relation to Inſects, as Beetles, Spiders, Graſhoppers, Bees, Waſps, Fire-flies, &c. theſe may be drowned altogether as ſoon as caught, in a little wide mouth'd Glaſs or Phial of the aforeſaid Spirits or Pickle, which you may carry in your pocket. But all Butterflies and Moths, or Night-Butterflies, being ſuch as have mealy Wings, which may be rub'd off with the Fingers, theſe muſt be put into your Pocket-book, or any other ſmall printed Book, as ſoon as caught, after the ſame manner as you do the dry Plants.

The beſt method to ſave their beauty is to pin them in a chip or cork bottom'd box, &c.

There needs no art in ſending Shells, but in chuſing ſuch as have their Snails or Fiſh in them, which may be eaſily taken out, by boiling them as ſoon as you come home. The Sea-ſhells will be very acceptable, yet the land and freſh water ones are the moſt rare and deſirable. Be careful to keep them whole.

All Oyſters, Cockles, Scollops, &c. viz. Bevalves, or Shells in Pairs, ſhould be preſerved with their original Ligaments or Fixtures.

All coloured Earths, Clays, Minerals, Metals and Ores, to be taken up as you find them; as alſo ſuch formed Stones as have any reſemblance to Shells or Bones, as Vertebræ, &c. theſe muſt be got as intire as you can, the like to be obſerved in ſlates that have the impreſſion of Plants, Fiſhes, Inſects, or other Bodies on them; theſe are to be found in Quarries, Mines, Pits, Caves, or wherever the Earth is laid open.

N.B. Amongſt Plants, the moſt common Graſs, Ruſh, Moſs, Fern, Thiſtles, Thorns, or vileſt Weeds you can find, will meet with the ſame acceptance as a ſcarcer Plant; ſo in all other things the moſt common as well as rare, *i. e.* whatever you meet with, may prove acceptable preſents, and have got preferment where Money would fail.